

What is claimed is:

1. A perpendicular magnetic recording disk including an underlayer between a substrate and a perpendicular magnetic recording layer for inducing perpendicular orientation of the perpendicular magnetic recording layer, the perpendicular magnetic recording layer having a thickness in the range where the ratio of perpendicular coercivity H_c to maximum perpendicular coercivity H_o decreases with reduced thickness of the perpendicular magnetic recording layer.

2. The perpendicular magnetic recording disk of claim 1, further comprising an intermediate soft magnetic layer between the underlayer and the perpendicular magnetic recording layer for forming closed magnetic loops together with the perpendicular magnetic recording layer.

3. The perpendicular magnetic recording layer of claim 1 or 2, wherein, in the range of thickness of the perpendicular magnetic recording layer, the rate of variation of the ratio of perpendicular remanent magnetization to maximum perpendicular remanent magnetization is greater than that of the ratio of perpendicular coercivity H_c to maximum perpendicular coercivity H_o .

4. The perpendicular magnetic recording layer of claim 1 or 2, wherein, in the range of thickness of the perpendicular magnetic recording layer, a noise level constant of proportionality α expressed as the following formula decreases with reduced thickness of the perpendicular magnetic recording layer:

$$\alpha = \frac{4\pi Mr}{H_c}$$

where Mr is the perpendicular remanent magnetization and H_c is the perpendicular coercivity.

5. The perpendicular magnetic recording disk of claim 1 or 2, wherein the perpendicular magnetic recording layer is formed of a CoCr alloy.

6. The perpendicular magnetic recording disk of claim 5, wherein the perpendicular magnetic recording layer further comprises at least one material selected from the group consisting of B, Pt, Ta, V, Nb, Zr, Y, and Mo.

5 7. The perpendicular magnetic recording disk of claim 6, wherein the perpendicular magnetic recording layer has a thickness of 20-50 nm.

8. The perpendicular magnetic recording disk of claim 2, wherein the intermediate soft magnetic layer is formed of a NiFe alloy.

10 9. The perpendicular magnetic recording disk of claim 8, wherein the intermediate soft magnetic layer further comprises at least one material selected from the group consisting of Nb, V, Ta, Zr, Hf, Ti, B, Si, and P.

15 10. The perpendicular magnetic recording disk of claim 9, wherein the intermediate soft magnetic layer has a thickness of 3-30 nm.

20 11. The perpendicular magnetic recording disk of claim 1 or 2, further comprising a protective layer and a lubricant layer sequentially on the perpendicular magnetic recording layer.